Restoration of native Westslope Cutthroat Trout to Selway Creek by removal of nonnative Brook, Brown, and hybrid Rainbow x Cutthroat trout with Rotenone

Draft Environmental Assessment

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Montana Fish, Wildlife & Parks
Region 3 Office
1400 South 19th Avenue
Bozeman, MT 59718

MONTANA FISH, WILDLIFE & PARKS

Executive Summary

The conservation and inherent value of native Westslope Cutthroat Trout (WCT) is substantial. WCT have experienced marked reductions in numbers and distribution; genetically unaltered WCT presently occupy 2.8% of their historic habitat within the Red Rock sub-basin (Bateman et al. 2019). In Selway Creek WCT have been extirpated and replaced with non-native Brook, Brown, and hybrid Rainbow x Cutthroat trout. Restoring a population of nonhybridized WCT within Selway Creek would secure an invaluable component of the Red Rock sub-basin's natural heritage for future generations to enjoy. Moreover, conservation of native WCT brings a range of benefits to local communities and is required under state and federal law.

WCT in the Red Rock sub-basin face several threats including reduced distribution and abundance, stream and riparian habitat conditions and spatial isolation; however, the single largest threat to the long-term persistence of WCT is the presence of non-native trout. Since the late 1800's, numerous nonnative fish species have been introduced throughout the Red Rock sub-basin and nonnative Brook, Brown, Rainbow, Yellowstone Cutthroat, and hybrid trout have become the dominant species in most streams historically occupied by WCT. Brook and Brown Trout displace WCT through competition or predation, while Rainbow Trout and Yellowstone Cutthroat Trout readily hybridize with WCT resulting in populations entirely comprised of hybrid individuals or mixed populations of hybrid and genetically unaltered fish. Currently, the strongest remaining WCT populations are those isolated from nonnative species by natural or manmade barriers, while those not protected by barriers have reduced distribution and densities or are irreversibly hybridized. The likelihood of long-term persistence of WCT populations not protected by barriers is low.

Restoration of WCT to over 30 miles of the Selway Creek drainage would create a population of over 20,000 individuals and almost double the present distribution of genetically unaltered WCT in the Red Rock sub-basin. The U.S. Forest Service is evaluating installation of a barrier to upstream fish passage at RM 0.8. Removing non-native trout upstream of the barrier would protect a restored WCT population from invasion and provide about 8 miles of habitat in Selway Creek, 7 miles in C L Creek (Figure 1), 4.5 miles in Ore Creek, 3.5 miles in Hidden Creek, 3 miles Surveyor Creek, 2 miles in Short and East creeks, 1 mile in Mooney Creek, and 5 miles in unnamed tributaries.

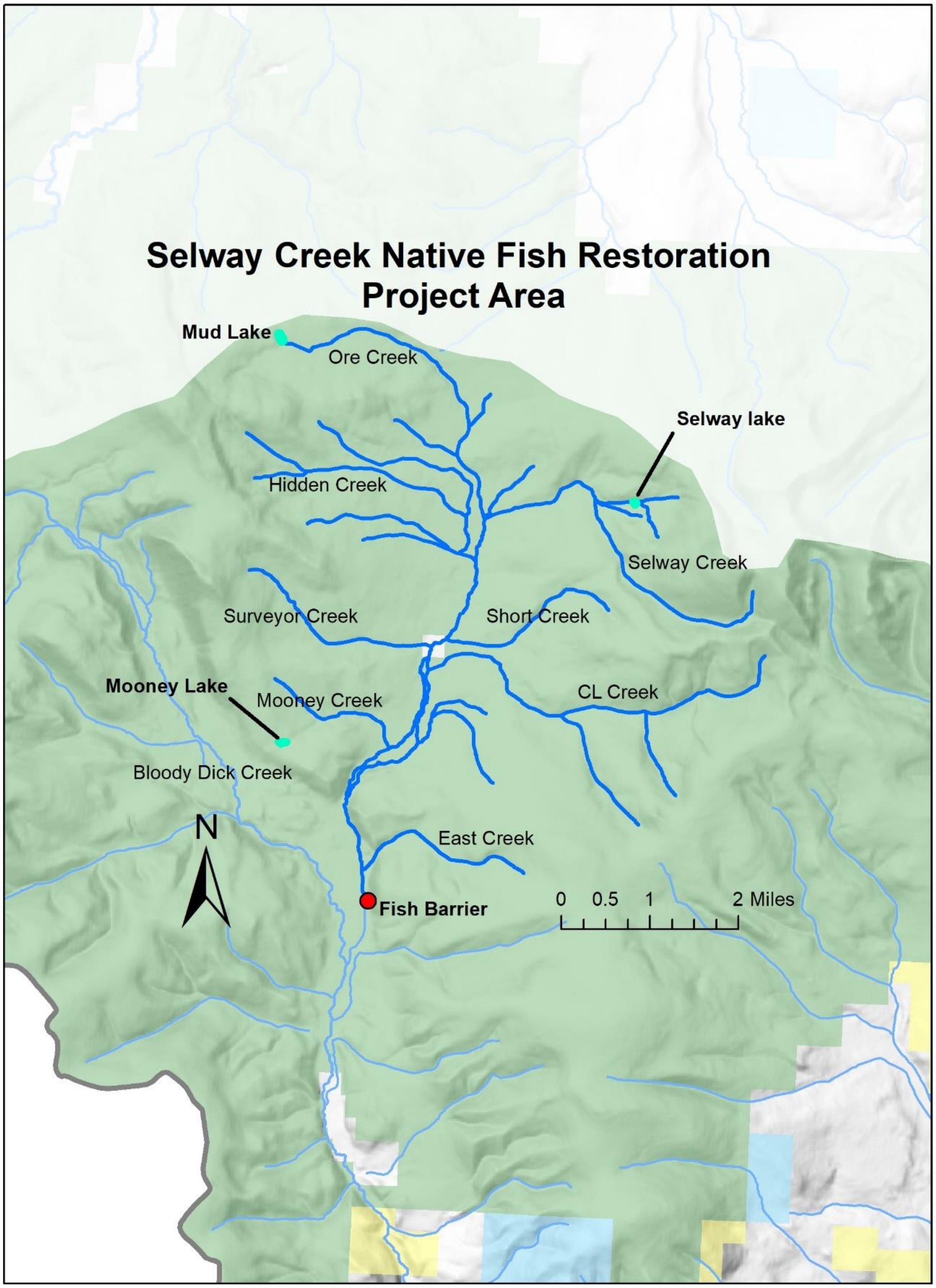

Figure 1. Selway Creek project area.

WCT would be refounded (i.e., stocked) by translocating aboriginal, genetically unaltered fish from up to eight populations in the Red Rock and Beaverhead sub-basins for up to five years. To provide angling opportunities while the population is being re-established, sterile triploid catchable-size WCT would be stocked in Selway Meadows for one to three years immediately following removal of non-native fish.

This restoration project would also benefit other native species. Native Western Pearlshell mussels still occur in low numbers and are restricted to a relatively short segment of Selway Creek. Western Pearlshell mussel is an S2 species in Montana that has notably declined statewide, including in Selway Meadows. Pearlshells are capable of living over 100 years and the population structure is skewed toward very old individuals, suggesting successful reproduction has been nominal to non-existent for decades with WCT absence being the primary factor limiting recruitment. Because WCT is the preferred intermediate host in Pearlshells reproductive cycle, cutthroat reestablishment is key to expanding and securing its viability in this watershed.

We would also attempt to establish an Artic grayling population founded using an aboriginal Red Rock sub-basin source. Arctic grayling were distributed throughout the upper Missouri River drainage prior to the mid-1850s. This population segment declined to about 4% of their perceived historic distribution by the 1990s, which led to formal consideration for listing under the Endangered Species Act. In 2014, Upper Missouri River grayling were found not warranted for listing (USFWS 2014); however, a court decision in 2018 mandated reassessment of that finding by 2020. One of the last populations of indigenous grayling resides in the Red Rock sub-basin's Centennial Valley. Grayling were historically distributed among at least a dozen Centennial Valley streams and three lakes at presumably high abundances; however, grayling began rapidly declining in the early 1950s and spawning was confined to predominately Red Rock Creek by 1977 (Nelson 1954, Mogen 1996). Distribution and abundance of Centennial Valley grayling reached a historic low in 1995 and have fluctuated since. Establishment of a Red Rock grayling population outside of the Centennial Valley using aboriginal Red Rock grayling from a reserve brood source would significantly expand the distribution and long-term viability of grayling in Montana and reduce the likelihood of listing under the Endangered Species Act.

This project has been collaboratively developed by a formal Forest Service Collaborative comprised of diverse user groups and will be implemented by a State and Federal partnership. The Beaverhead-Deerlodge Forest Working Group is a citizen-based committee of people who represent key interests, geographic balance, and knowledge of the Beaverhead-Deerlodge National Forest. Members represent timber, county commissioners, agriculture/ranching, quiet and motorized recreation, conservation, hunting and fishing, outfitters/guides, and citizen interests. This group identified Selway Meadows as preferred project, with WCT restoration being an integral component.

EAs are a requirement of the Montana Environmental Policy Act (MEPA) and the National Environmental Policy Act (NEPA), which require state and federal agencies to consider the environmental, social, cultural, and economic effects of proposed actions. This EA considers potential consequences of two alternatives to conserve fish in Selway Creek. A third alternative (mechanical suppression by electrofishing) was considered and eliminated as described below. The two alternatives considered are:

1. Alternative 1 (Preferred): Removing non-native Brook, Brown, and hybrid Rainbow x Cutthroat Trout from 36 miles of Selway Creek and its tributaries with rotenone.

2. Alternative 2: No action

Alternative 1 is the preferred alternative. It would have short-term, minor effects on wildlife, recreation, and vegetation. This alternative would be highly beneficial to WCT, Western Pearlshell mussels, and Arctic grayling and would be a substantial contribution to the long-term conservation of these species in the Red Rock sub-basin.

MEPA requires public involvement and opportunity for the public to comment on projects undertaken by the acts' respective agencies. A public comment period will extend from August 9th to September 9th. A public meeting will be held in Dillon, MT on September 3rd, at DNRC (860 N. Montana), beginning at 5:30 pm. Interested parties should send comments to:

Montana Fish, Wildlife & Parks – Region 3

c/o Selway Creek WCT Restoration

1400 S. 19th Ave. Bozeman, MT 59718

Email: fwprg3ea@mt.gov

1 Table of Contents

List of Abbreviations

ARM	Administrative Rules of Montana
CGNF	Custer Gallatin National Forest
DEGEE	diethyl glycol monoethyl ether
DEQ	Montana Department of Environmental Quality
EA	Environmental Assessment
EPT	Ephemeroptera, Plecoptera, Trichoptera (mayflies, stone flies, & caddis flies)
FS	Forest Service
FWP	Montana Fish, Wildlife & Parks
GMU	Geographic management unit
$KMnO_4$	potassium permanganate
MCA	Montana Code Annotated
MCTSC	Montana Cutthroat Trout Steering Committee
MEPA	Montana Environmental Policy Act
MNHP	Montana Natural Heritage Program
NEPA	National Environmental Policy Act
SNF	Shoshone National Forest
WFGD	Wyoming Fish and Game Department
YNP	Yellowstone National Park
MOU	Memorandum of understanding
MRDG	Minimum Requirements Decision Guide
MSDS	Material data safety data sheet
NPS	National Park Service
USEPA	United States Environmental Protection Agency

2 PROPOSED ACTION and BACKGROUND

2.1 *Type of Proposed Action*

Conservation Action for Westslope Cutthroat Trout, Western Pearlshell Mussel, and Arctic Grayling.

2.2 *Agency Authority for the Proposed Action*

Montana state law provides FWP with the authority for implementation of fish management and restoration projects (MCA § 87-1-702; § 87-1-201[9][a]). In addition, Montana state law authorizes FWP to manage wildlife, fish, game and nongame animals to prevent the need for listing under the Endangered Species Act or ESA, and listed, sensitive, or species that are candidates for listing under the ESA must be managed in manner that assists in the maintenance or recovery of the species (MCA§ 87-5-107). Montana state law also allows the use of chemicals to remove fish (ARM 12. 7. 1503[1][f][ii]).

Planning documents and strategies developed by agencies and collaborating entities also provide official justification for the proposed project (**Error! Not a valid bookmark self-reference.**). These include conservation agreements among stakeholder groups, state and federal laws, and agency plans designed to conserve, secure and protect WCT within the Red Rock sub-basin (i.e., restore WCT to 20% of historic range).

Table 1. Planning and strategy documents with relevance to Conservation of WCT in Ramshorn Creek.

Agency	*Citation*	*Website*
Montana Cutthroat Trout Steering Committee (MCTSC)	Memorandum of Understanding and Conservation Agreement for Westslope Trout and Yellowstone Cutthroat Trout in Montana (2007)	http://fwp. mt. gov/fishAndWildlife/management/yellowstoneCT/
FWP	Westslope Cutthroat Trout Status and Conservation within the Beaverhead, Red Rock and Ruby River Sub-basins of Southwest Montana (Bateman et al. 2019)	https://myfwp.mt.gov/fishMT/references/false
FWP	Statewide Fisheries Management Plan (2014)	http://fwp. mt. gov/fishAndWildlife/management/fisheries/statewidePlan/

FWP	Wild Fish Transfer Policy (1996)	http://fwp. mt. gov/fishAndWildlife/management/westslopeCT/default. html
FWP	Piscicide Policy (2017)	Internal document

2.3 *Estimated Commencement Date*

The estimated commencement date is August 2020.

2.4 *Name and Location of the Project*

Restoration of native Westslope Cutthroat Trout to Selway Creek by removal of nonnative Brook, Brown, and hybrid Rainbow x Cutthroat trout with Rotenone.

Selway Creek is in the Red Rock River watershed (Figure 2). The project is in Beaverhead County, approximately 25 miles from Grant, Montana. The legal description is T8S, R15W, sections 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15,16, 21, 22, 23, 24, 25, 26, 27, 34, 35, 36, T8S, R14W, sections 5, 6, 7, 8, 9, 16, 17, 18, 19, 20, 21, 28, 29, 30, 31 and T7S, R15W, sections 33, 34, 35, 36.

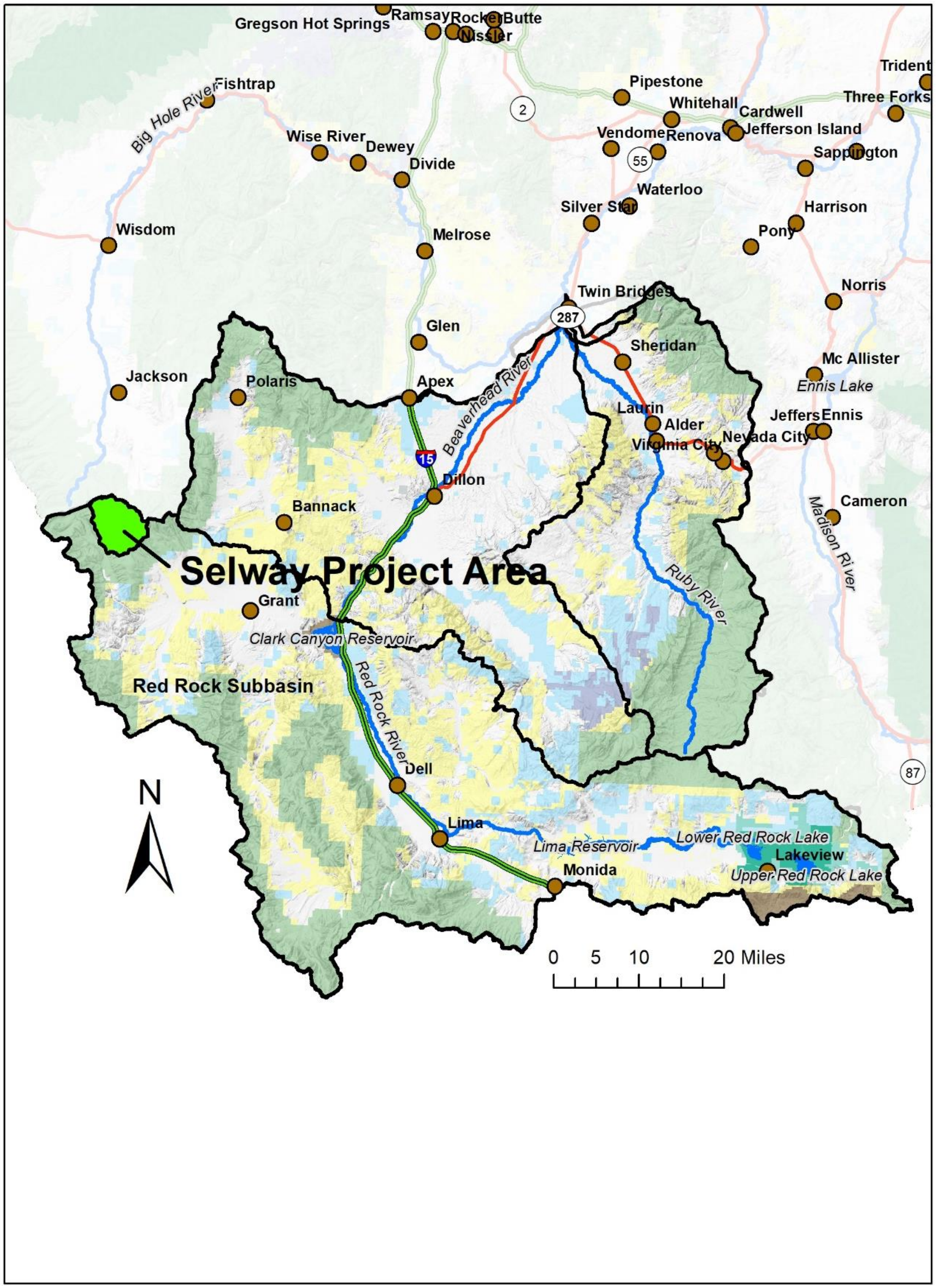

Figure 2. Map of project area.

2.5 *Project Size (Affected Area)*

1.	Developed/residential	0 acres
2.	Industrial	0 acres
3.	Open space/woodland/recreation	0 acres
4.	Wetlands/riparian areas	36 stream miles & 24 lake acres
5.	Floodplain	0 acres
6.	Irrigated cropland	0 acres
7.	Dry cropland	0 acres
8.	Forestry	0 acres
9.	Rangeland	0 acres

Selway Creek is about 8.8 miles long, with the upper 8 miles occurring within the project area. It has eight named tributaries; East (RM 1.2), Mooney (RM 2.9), C.L. (RM 4.1), Surveyor (RM 4.4), Short (RM 4.6), Hidden (RM 5.6), and Ore/Spring (RM 6.1) creeks occur within the project area. Flow measurements taken during baseflow conditions over the past five years on Selway Creek documented an average discharge of 10 cfs at the barrier location. C.L. Creek had an average baseflow discharges of about 2 cfs and all other tributaries were less than 1 cfs at their confluence with Selway Creek.

There are three lakes within the project area, although only one (Selway Lake) contains fish and will be treated. Selway Lake has a surface area of 23.5 acres at full pool and supports a Brook Trout population. Its maximum depth is 16.7 feet, and the lake is 24.4-acre feet in volume. The lake has two unnamed inlets and its outlet is Selway Creek, which flows at 2.5 cfs at baseflow at that location. Mooney and Mud lakes also occur within the drainage; however, neither is fish bearing. Mooney Lake is 1.7 acres, has a maximum depth of 5.2 feet, mean depth of 2.5 feet, and volume of 3.2 acre-feet. Mud Lake is 3.8 acres, has a maximum depth of 5.2 feet, mean depth of 2.5 feet, and volume of 8.0 acre-feet. Mooney and Mud lakes will not be treated unless pre-project eDNA monitoring indicates the presence of non-native fishes.

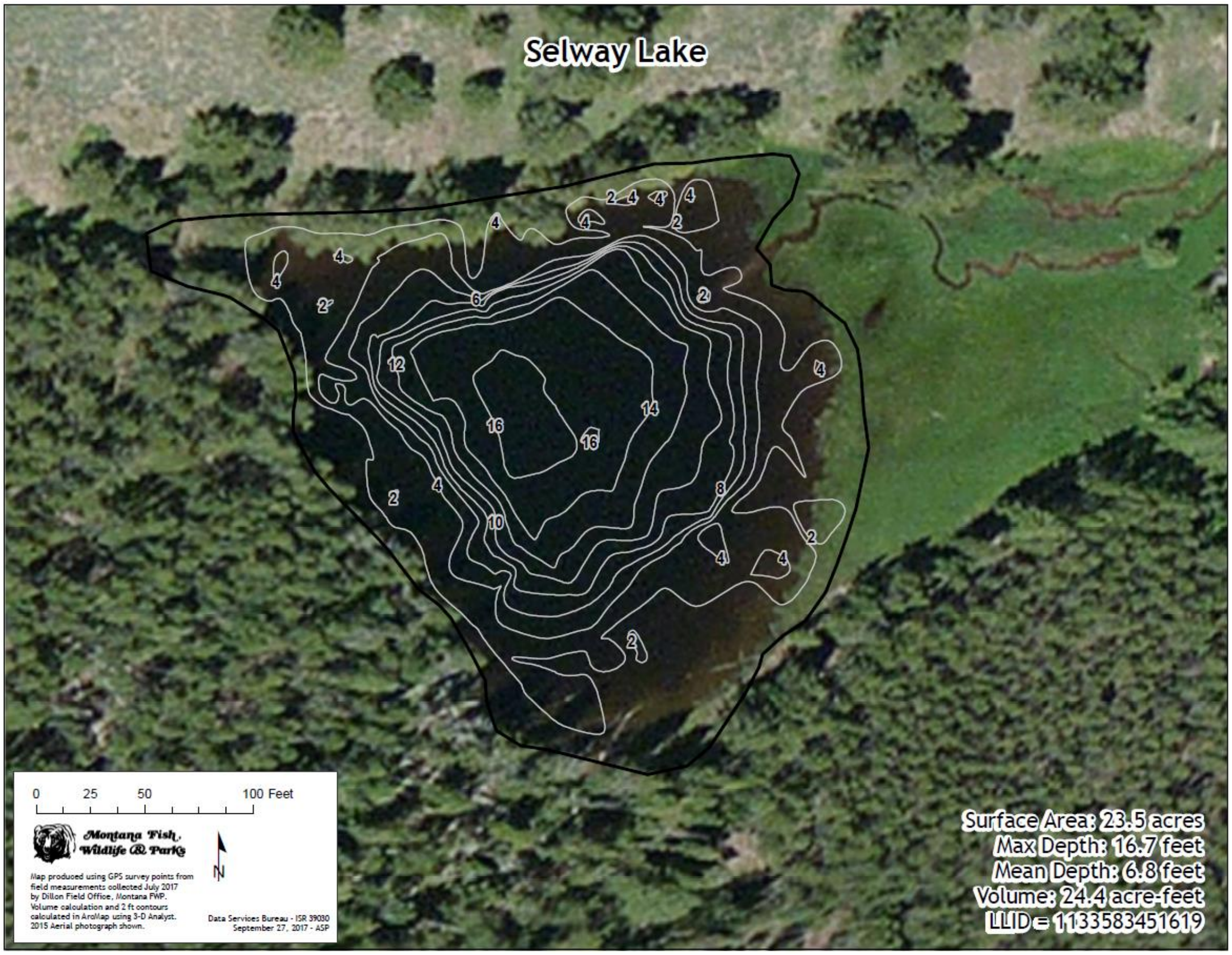

Figure 3. Bathymetry of Selway Lake.

2.6 *Narrative Summary of the Proposed Action and the Purpose of the Proposed Action*

2.6.1 Summary and Background

Westslope cutthroat trout, Montana's state fish, has declined in abundance, distribution, and genetic diversity throughout its native range (Shepard et al. 2003). Reduced distribution of WCT is particularly evident in the Missouri River drainage of Montana where genetically pure populations are estimated to persist in about 4% of habitat they historically occupied. Major factors contributing to this decline include competition with nonnative Brook, Brown and Rainbow Trout that were first introduced in Montana in the 1890's, hybridization with Rainbow and Yellowstone Cutthroat Trout, habitat changes, and isolation to small headwater streams. Due to these threats, most remaining WCT populations in the Missouri River drainage are considered to have a low likelihood of long-term (100 years) persistence unless conservation actions are implemented (Shepard et al. 1997). The U.S. Fish and Wildlife Service has been petitioned to list WCT as a Threatened species on two occasions but found listing was not warranted stating "The conservation efforts presently being accomplished as part of the routine management objectives of State and Federal agencies, and as part of formal interagency agreements and plans, provide substantial assurance that the WCT subspecies is being conserved." Nevertheless, the species remains a Species of Concern in Montana, with projects like the proposed restoration of WCT to Selway Creek contributing to such decisions.

Protecting and securing the remaining genetically unaltered WCT populations is the highest priority conservation action for WCT in the Red Rock sub-basin (Bateman et al. 2019). Objective 3 of the *Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout and Yellowstone Cutthroat Trout in Montana* is "Seek collaborative opportunities to restore and/or expand each cutthroat trout subspecies into selected suitable habitats within their respective historic ranges." The *Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout and Yellowstone Cutthroat Trout in Montana* was cooperatively developed and signed by American Wildlands, Blackfeet Tribe, Crow Tribe, Confederated Salish and Kootenai Tribes, Federation of Fly-Fishers, Glacier National Park, Greater Yellowstone Coalition, Montana Chapter of the American Fisheries Society, Montana Department of Natural Resources & Conservation, Montana Farm Bureau, Montana Fish, Wildlife & Parks, Montana Stockgrowers Association, Montana Trout Unlimited, Montana Wildlife Federation, Natural Resource Conservation Service, Plum Creek, private landowners, the Bureau of Land Management, the U.S. Fish & Wildlife Service, the U.S. Forest Service, and Yellowstone National Park.

Large-scale Westslope cutthroat trout (WCT) restoration projects are needed to significantly improve regional population status and benefit other native aquatic fauna. Long-term viability is constrained because most populations are confined to short reaches of headwater streams; on average extant populations are isolated in less than 4 stream miles and lack a migratory life history. Resultantly, reestablishment of meta-populations founded with genetically unaltered aboriginal sources is among our highest interagency conservation priorities.

Strong commitment to habitat protection and stewardship make Selway Meadows an ideal WCT restoration opportunity. In 2007 the Forest Service acquired 1200 acres of private valley bottomlands in SW Montana called Selway Meadows because of its substantial aquatic and wildlife values. The purchase consolidated Forest Service ownership and provided public access to a highly attractive stream and meadow system. Since acquisition the Forest Service has worked to improve and protect habitat quality throughout the drainage. Riparian grazing standards consistent with the Revised Forest Plan were implemented and three grazing exclosures were constructed. Instream flow evaluations resulted in replacement of inefficient and broken irrigation infrastructure and implementation of an irrigation plan that will improve watershed resiliency to climate change. Two tributaries were reconnected to the mainstem of Selway Creek and extensive geomorphologic and water quality work has occurred to evaluate the potential for active and passive restoration throughout the watershed. A lasting investment to improve and maintain aquatic habitat values through management and stewardship has been made.

Restoration of WCT to Selway Meadows will restore an intact, native aquatic assemblage. Native WCT have been replaced by non-native Brook, Brown, and Rainbow Trout, which now dominate the fishery in the Selway Creek watershed. Non-native fish densities average about 1400 fish per mile in the mainstem of Selway Creek and 450 fish per miles in its tributaries. Resultantly, restoration of WCT to over 30 miles of the Selway Creek drainage would create a population of over 20,000 individuals and almost double the present distribution of genetically unaltered WCT in the Red Rock sub-basin., which would be among the strongest in the upper Missouri River basin.

This restoration project would also benefit other native species. Native Western Pearlshell Mussels still occur in low numbers and are restricted to a relatively short segment of Selway Creek. Western Pearlshell Mussel is an S2 species (i.e., at risk because of very limited and/or potentially declining population numbers, range and/or habitat, making it vulnerable to extirpation in Montana) that has notably declined statewide, including in Selway Meadows. Pearlshells are capable of living over 100 years and the population structure is skewed toward very old individuals, suggesting successful reproduction has been nominal to non-existent for decades with WCT absence being the primary factor limiting recruitment. Because WCT is the preferred intermediate host in Pearlshells reproductive cycle, WCT reestablishment is key to expanding and securing its viability in this watershed.

FWP would also attempt to establish an Artic grayling population founded using an aboriginal Red Rock sub-basin source. Upper Missouri River Arctic grayling were distributed throughout the upper Missouri River drainage prior to the mid-1850s. This population segment declined to about 4% of their perceived historic distribution by the 1990s, which led to formal consideration for listing under the Endangered Species Act. In 2014, Montana grayling were found not warranted for listing (USFWS 2014); however, a court decision in 2018 mandated reassessment of that finding by 2020. One of the last populations of indigenous grayling resides in the Red Rock sub-basin’s Centennial Valley. Grayling were historically distributed among at least a dozen Centennial Valley streams and three lakes at presumably high abundances; however, grayling began rapidly declining in the early 1950s and spawning was confined to predominately Red Rock Creek by 1977 (Nelson 1954, Mogen 1996). Distribution and abundance of CV grayling reached a historic low in 1995 and have fluctuated since. Establishment of a Red Rock grayling population outside of the Centennial Valley using aboriginal Red Rock grayling from a reserve brood source would significantly expand the distribution and long-term viability of grayling in Montana and reduce the likelihood of listing under the Endangered Species Act.

This project is part of a larger integrated restoration project that has been collaboratively developed by a formal Forest Service Collaborative comprised of diverse user groups and will be implemented by a State and Federal partnership. The Beaverhead-Deerlodge Forest Working Group is a citizen-based committee of people who represent key interests, geographic balance, and knowledge of the Beaverhead-Deerlodge National Forest. Members represent timber, county commissioners, agriculture/ranching, quiet and motorized recreation, conservation, hunting and fishing, outfitters/guides, and citizen interests. This group identified Selway Meadows as a priority area, with WCT restoration being an integral component.

Selway Creek is presently occupied by non-native Brook, Brown, and Rainbow x Cutthroat hybrid trout. No irrigation water is withdrawn from Selway Creek upstream of the barrier that will comprise or bypass the fish barrier and downstream end of the project area. Land management activities by the USFS are consistent with native trout conservation goals (see Attachment 1 – letter from USFS). There are no amphibian or invertebrate Species of Concern in the Selway Creek drainage, other than Western Pearlshell.

2.6.2 Proposed Action

The proposed action is to establish and secure a genetically unaltered population of WCT in Selway Creek by removing all non-native Brook, Brown and hybrid Rainbow x Cutthroat Trout upstream of the fish barrier at RM 0.8 using rotenone based piscicides (Figure 1). Treated reaches would include all waters that support fish in stream channels upstream of the barrier (about 36 total stream miles and one lake). WCT would be refounded by translocating aboriginal, genetically unaltered fish from up to eight populations in the Red Rock and Beaverhead sub-basins for up to five years. To provide angling opportunities while the population is being re-established, sterile triploid catchable-size WCT would be stocked in Selway Meadows for one to three years immediately following removal of non-native fish. FWP will also attempt to establish a grayling population using aboriginal Red Rock fish from a genetic reserve broodsource outside of the Centennial Valley. Restoration of WCT to over 30 miles of the Selway Creek drainage would create a population of over 20,000 individuals and almost double the present distribution of genetically unaltered WCT in the Red Rock sub-basin.

2.6.3 Method of Fish Removal

The chemical proposed for removal of fish uses rotenone as its active agent. Rotenone is a naturally occurring substance derived from the roots of tropical plants in the bean family such as the jewel vine (*Derris* spp.) and lacepod (*Lonchocarpus* spp.) that are found in Australia, Oceania, southern Asia, and South America. Rotenone has been used by native people for centuries to capture fish for food in areas where these plants are naturally found. It has been used in fisheries management in North America since the 1930s.

2.6.4 How Does It Work?

Rotenone is applied to the water and enters the fish through the gills. It is effective at very low concentrations with fish because it is readily absorbed into the bloodstream through the thin cell layer of the gills. Mammals, birds and other non-gill breathing organisms do not have this rapid absorption route into the bloodstream and are not affected by consuming treated water or dead fish at concentrations used in fisheries management. Rotenone kills fish by interrupting the Krebs Cycle in individual cells.

2.6.5 Treatment Area

Rotenone would be applied to all waters in the Selway Creek watershed upstream of RM 0.8, with the exception of Mooney and Mud lakes if pre-treatment environmental DNA monitoring indicates they are fishless (Figure 1). Rotenone would be actively detoxified at the barrier location and confirmed to be neutralized within 30 minutes of travel time downstream.

Waters within the project area would be treated with CFT Legumine at concentrations following the label recommendations, which is typically within the range of 0.5 and 1.0 ppm. The exact concentration of the selected formulation will be determined in the field, by conducting bioassays on caged fish, with the intent of determining the lowest dose that will meet the project objective of eradication of fish in the project area.

Selway Lake has a volume of 24.4 acre-feet. Approximately 8 gallons of CFT Legumine is required to achieve 1.0 ppm. CFT Legumine may persist in the lake for several weeks, depending on water temperature, sunlight, alkalinity and the amount of fresh water entering the lake from contributing tributaries; however, the volume of Selway Lake would be entirely replaced by expected inflows of fresh water (2.5 cfs) every five days.

Access to the treatment area will be closed during the application of rotenone (3-5 days). Signs will be places at public access points, trail and road crossings and other avenues where access to the treatment area can be readily obtained.

2.6.6 Method of Application

Drip stations would be used to dispense the rotenone in streams. A drip station is a small container that dispenses a measured amount of liquid rotenone to a stream at a constant rate for a specific period of time. Rotenone would be applied to the lake by boat using an electric pump to ensure mixing. Crews would apply rotenone to the backwaters of streams and marshy areas with backpack sprayers. The materials and equipment would be transported to the site by vehicle, horses, or people.

Treatment would occur for 8 to 10 hours each day. When each stream treatment ends, freshwater entering the stream would dilute rotenone, contributing to its degradation. The downstream end of each treatment area will be block netted each day to prevent immigration of non-native fish into recently treated waters. Treating the streams in this watershed will take 3 to 4 days.

2.6.7 Deactivation

Potassium permanganate is a strong oxidizer that when applied to water readily neutralizes rotenone. Potassium permanganate would be applied to the stream at the lower end of the treatment area beginning at least two hours before the theoretical arrival time of rotenone and then stopped only when the last of the rotenone has theoretically passed neutralization station (calculated as the time of last application of rotenone plus the travel time to reach the station) and after all sentinel fish immediately above the neutralization station survive an additional 4 hours without stress. A block net will be installed at the end of the deactivation zone to prevent dead fish from drifting downstream of the project area unless high discharge or water velocity precludes the effective use of a block net.

2.6.8 Fate of Dead Fish

Dead fish that surface would be left on-site in the water. In lakes, 70% of rotenone-killed fish sink to the bottom (Bradbury 1986), where they are not visible. Bacteria and aquatic invertebrates promote rapid decay of fish carcasses, and nutrients contributed from dead fish stimulate recovery of zooplankton and other aquatic invertebrates. Terrestrial scavengers contribute to the disappearance of carcasses, and piscicide-killed fish do not present health risks to organisms consuming them. Previous treatments have shown that fish killed by rotenone rapidly decay and are difficult to find even after a few days post treatment. Information regarding animal and human consumption of rotenone exposed fish is discussed in sections 3.1.5 and 3.2.3 below.

2.6.9 Duration of project

Because of the complexity of stream systems, complete eradication of target fish species is rarely achieved in with one treatment. Generally, two treatments in consecutive years are required to eliminate all target fish species. A second treatment will likely be necessary approximately one year after the first treatment to ensure achievement of the desired objective of eradicating nonnative Brook, Brown, and hybrid Rainbow x Cutthroat Trout. Effectiveness of the treatment would be ascertained through electrofishing and environmental DNA surveys of the treated sections of Selway Creek and associated tributaries. The same treatment, safety measures and precautions used during the first treatment would be utilized during the second treatment if it is necessary.

2.6.10 Monitoring

Effectiveness of the treatment would be determined through electrofishing and environmental DNA surveys of the treated sections of Selway Creek and associated tributaries. Selway Lake will be monitored with gill nets and environmental DNA surveys.

Recovery of benthic macroinvertebrate species will be evaluated over two successive years by collecting kick samples in three sites in the treatment area, one in the deactivation zone, and one in a control (untreated nearby stream).

The Selway Creek watershed will be restocked with WCT following successful removal of non-native fishes. To provide angling opportunities while the population is being re-established, sterile triploid catchable-size WCT would be stocked in the mainstem of Selway Creek between Short Creek and the barrier, after either the first or second treatment pending results of monitoring, for one to three years following removal of non-native fish. Aboriginal Upper Missouri River basin WCT will be concurrently restored throughout the drainage by translocating live, wild genetically unaltered WCT from neighboring populations within the Ruby (Jack, Greenhorn creeks), Red Rock (Painter, Browns, Meadow creeks), or Beaverhead (Brays, Cottonwood creeks) Sub-Basins. All translocations of fish will follow procedures and protocols outlined in the Westslope Cutthroat Trout Status and Conservation within the Beaverhead, Red Rock and Ruby River Sub-basins of Southwest Montana (Bateman et al. 2019) and adhere to FWP Wild Fish Transfer Policy**.** Red Rock Lakes origin Arctic grayling will be stocked from a genetic reserve brood based on availability using fertilized eggs and remote site incubators. Arctic grayling repopulation would occur at Selway Lake and suitable spring areas (i.e., Spring Creek).

3 Environmental Review

3.1 *Physical Environment*

3.1.1 Land Resources

LAND RESOURCES **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Soil instability or changes in geologic substructure?		X				
b. Disruption, displacement, erosion, compaction, moisture loss, or over-covering of soil which would reduce productivity or fertility?		X				
c. Destruction, covering or modification of any unique geologic or physical features?		X				
d. Changes in siltation, deposition or erosion patterns that may modify the channel of a river or stream or the bed or shore of a lake?		X				
e. Exposure of people or property to earthquakes, landslides, ground failure, or other natural hazard?		X				

Comment 1. Construction of the fish barrier and its impacts on land resources are being evaluated by the Beaverhead-Deerlodge National Forest.

3.1.2 Water

WATER **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Discharge into surface water or any alteration of surface water quality including but not limited to temperature, dissolved oxygen or turbidity?			X		YES	2a
b. Changes in drainage patterns or the rate and amount of surface runoff?		X				
c. Alteration of the course or magnitude of flood water or other flows?		X				
d. Changes in the amount of surface water in any water body or creation of a new water body?		X				
e. Exposure of people or property to water related hazards such as flooding?		X				
f. Changes in the quality of groundwater?		X				2f
g. Changes in the quantity of groundwater?		X				
h. Increase in risk of contamination of surface or groundwater?			X		YES	see 2af
i. Effects on any existing water right or reservation?		X				
j. Effects on other water users as a result of any alteration in surface or groundwater quality?			X			See 2j
k. Effects on other users as a result of any alteration in surface or groundwater quantity?		X				
l. Will the project affect a designated floodplain?		X				
m. Will the project result in any discharge that will affect federal or state water quality regulations? (Also see 2a)			X		YES	2m

Comment 2a

The proposed project is designed to intentionally introduce a pesticide to surface water to remove unwanted fish. The impacts would be short term and minor. CFT Legumine 5% liquid rotenone is an EPA registered pesticide and are safe to use for removal of unwanted fish, when handled properly. The concentration of CFT Legumine 5% liquid proposed is 0.5 to 1.0 ppm in water, but could be adjusted within the label-allowed limits based upon the results of on-site assays.

We expect the stream to detoxify within 48 hours after rotenone application. Several factors influence rotenone's persistence and toxicity. Warmer water temperatures promote deactivation. Rotenone has a half-life of 14 hours at 24 °C, and 84 hours at 0 °C (Gilderhus et al. 1986, 1988), meaning that half of the rotenone is deactivated and is no longer toxic in that time. As temperature and sunlight increase, so does deactivation of rotenone. Higher alkalinity (>170 mg/L) and pH (>9.0) also increase the rate of deactivation. Rotenone tends to bind to, and react with, organic molecules, and availability of organic matter substantially decreases the persistence of rotenone (Dawson et al. 1991). Dilution from groundwater inputs or tributary streams also contributes to deactivation of rotenone

FWP's piscicide policy requires deactivation of rotenone in streams and lake outflows using potassium permanganate ($KMnO_4$), a strong oxidizer, to minimize exposure beyond the treatment area unless the stream goes dry at the downstream end of the treatment area and there are no associated groundwater concerns. This dry crystalline substance is mixed with stream or lake water to produce a concentration of liquid sufficient to detoxify the rotenone (2-4 ppm). Deactivation is accomplished after about 15-30 minutes of exposure time between the two compounds.

To achieve full neutralization, potassium permanganate must be continuously delivered at a rate such that a residual level of potassium permanganate of 0. 5-1.0 ppm is maintained downstream of the application the distance the water flows in 30 minutes. This distance is known as the neutralization or deactivation zone. A chlorine meter would be used to monitor the presence of potassium permanganate at the end of the 30-minute contact zone to ensure that 0. 5-1. 0 ppm potassium permanganate is present and that the rotenone is completely neutralized. In addition to direct measurement of the potassium permanganate in the water, caged non-native Brook and Cutthroat x Rainbow hybrid Trout would be placed in the stream to monitor the effectiveness of the detoxification station during the treatment. Caged fish would be placed downstream of the 30-minute contact zone and monitored. Distress or the lack thereof in these caged fish indicates whether neutralizing is effective. Application of potassium permanganate would continue until the theoretical time in which all treated waters have passed the fish barrier and caged fish placed immediately upstream of the neutralization zone can survive for an additional 4 hours (for additional information on see comment 2a below).

Multi-day treatments

- **Stream Treatments**

Situation A. Travel time is less than 8 hours (from the lowermost point of application) to the detoxification station:

Step 1: Sentinel fish must be placed immediately above the detox station

Step 2: Start potassium permanganate application 2 hours before the theoretical arrival time of the rotenone.

Step 3: potassium permanganate must be applied until the last of the rotenone has theoretically passed the detox station (calculated as the time of last application of rotenone plus the travel time to reach detox station), and then stopped only after all sentinel fish immediately above the detox station survive an additional 4 hours without stress.

Situation B. Travel time is greater than 8 hours (from the lowermost point of application) to the deactivation station:

Step 1: Sentinel fish must be placed immediately above the detox station and at 2-hour travel time intervals upstream.

Step 2: Begin monitoring the 4-hour sentinel fish when the rotenone would theoretically arrive at that location, and every 1 hour thereafter until the theoretical clearing time of rotenone has occurred.

Step 3: If any sentinel fish die or are stressed at any time at the 4-hour station, start detox immediately.

Step 4: potassium permanganate must be applied until the last of the rotenone has theoretically passed the detox station (calculated as the time of last application of rotenone plus the travel time to reach detox station), and then stopped only after all sentinel fish immediately above the detox station survive an additional 4 hours without stress.

- **Lake Treatments with an outlet**

Situation C. Travel time is greater than 8 hours (from the lowermost point of application) to the deactivation station:

Step 1: Sentinel fish must be placed immediately above and at 4 hours travel time upstream from the detox station. If only a lake is being treated, the lowest point is the lake outlet; if the outlet stream is also being treated, the lowest point is the farthest downstream treatment with a drip or backpack sprayer.

Step 2: Begin monitoring the 4-hour sentinel fish when the rotenone would theoretically arrive at that location, and every 1 hour thereafter until the theoretical clearing time of rotenone has occurred.

Step 3: If all sentinel fish at the 4-hour station **do not** show signs of stress after an additional 8 hours of monitoring, then detox can be stopped.

Step 5: If any sentinel fish at 4 hours **do** show signs of stress within 8 hours, detox must continue operating for a minimum of 24 hours (plus travel time) and then stop only after all sentinel fish immediately above detox station survive four hours without signs of stress.

Dead fish would result from this project, although due to sinking and rapid decomposition, a relatively small proportion of dead fill would be noticeable. In Washington lakes, approximately 70 % of rotenone-killed fish did not surface (Bradbury 1986). Although no trout were involved with his study, Parker (1970) reported that at water temperatures of 40 °F and less, dead fish required 20-41 days to surface. The most important factors inhibiting fish from ever surfacing are cooler water (<50 °F) and deep water (>15 feet). The majority of Selway Lake is less than 15 feet deep so some surfacing is expected.

Decomposition of rotenone-killed fish in lakes can result in temporary nutrient enrichment and algal blooms. In Washington, 9 of 11 treated with rotenone experienced an algal bloom shortly after treatment, and an estimated 70 % of the phosphorus of the fish stock would remain in the lake with decomposition of fish (Bradbury 1986). Nutrient loading from fish left to decay may temporarily contribute to aesthetically unappealing algal blooms; however, keeping the nutrients within the body of water is beneficial. Fish left in a treated lake contribute towards food web recovery, as the nutrients contributed from their decomposing bodies stimulates phytoplankton production, which in turn feed zooplankton that recolonize treated lakes. Natural recolonization of zooplankton and other aquatic invertebrates result in reestablishment of the forage base for fish. Any changes or impacts to water quality resulting from decaying fish would be short term and minor.

Comment 2f

No contamination of groundwater is anticipated to result from this project. Because ground water leaving Selway Creek must travel through bed sediments, soil, and gravel, and rotenone is known to bind readily with these substances, we do not anticipate any contamination of ground water (Skaar 2001; Engstrom-Heg 1971, 1976; Ware 2002). Rotenone moves only one inch in most soil types; the only exception would be sandy soils where movement is about three inches (Hisata 2002). In California, studies where wells were placed in aquifers adjacent to and downstream of rotenone applications have never detected rotenone, rotenolone, or any of the other organic compounds in the formulated products (CDFG 1994).

Case studies in Montana have concluded that rotenone movement through groundwater does not occur (FWP unpublished data). For example, at Tetrault Lake, Montana neither rotenone nor inert ingredients were detected in a nearby domestic well, which was sampled two and four weeks after applying 1.8 ppm rotenone to the lake. This well was chosen because it was down gradient from the lake and drew water from the same aquifer that fed and drained the lake. FWP has sampled wells and groundwater in several piscicide projects that removed fish from ponds, and no rotenone, or the inert ingredients of the selected formulation were detected in ponds ranging from 65 to 200 feet from the treated waters. Likewise, application of piscicide to streams has not resulted in contamination of neighboring wells or groundwater. In 2015 and 2016, Soda Butte Creek flowing through Cooke City and Silver Gate, Montana was treated with CFT Legumine. Wells drawing water from the same open aquifer as the treated stream were sampled during and after the treatment and all found to be free of rotenone.

Comment 2j

The CFT Legumine label states… "Do not use water treated with rotenone to irrigate crops or release within ½ mile upstream of an irrigation water intake in a standing body of water such as a lake, pond, or reservoir. For applications > 40 ppb or 0.04 ppm active rotenone (> 0.8 ppm 5 % rotenone formulation) in waters with drinking water intakes or hydrologic connections to wells, 7 to 14 days before application, the certified applicator or designee under his/her direct supervision must notify to the party responsible for the public water supply, or individual private water users, to avoid consumption of treated water until: (1) active rotenone is < 0. 04 ppm as determined by analytical chemistry, (2) fish of the *Salmonidae* or *Centrarchidae* families can survive for 24 hours, (3) dilution with untreated water yields a calculation that active rotenone is < 0. 04 ppm, or (4) distance or travel time from the application sites demonstrates that active rotenone is < 0. 04 ppm.

Impacts to irrigation and potable water intakes would be short term and minor. Irrigation by diversion of surface water from streams within the project area occurs; however, all headgates were recently replaced and will be closed during treatment. Water will be detoxified upstream of all other irrigation diversions in the basin.

Comment 2m

The 2016 Pesticide General Permit issued on a five-year cycle by Montana DEQ provides the authority for FWP to apply piscicides. FWP, and any other piscicide applicator, must develop a pesticide discharge management plan as a condition for coverage under this permit. For FWP, the plan consists of procedures and protocols developed by and detailed in FWP's Piscicide Policy, the AFS Rotenone Standard Operating Procedures manual, and annual training and critique of projects provided by the FWP Piscicide Committee.

3.1.3 Air

AIR **Will the proposed action result in:**	**IMPACT** **Unknown**	**None**	**Minor**	**Potentially** **Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Emission of air pollutants or deterioration of ambient air quality? (also see 13 (c))			X			3a
b. Creation of objectionable odors?			X		yes	3b
c. Alteration of air movement, moisture, or temperature patterns or any change in climate, either locally or regionally?		X				
d. Adverse effects on vegetation, including crops, due to increased emissions of pollutants?		X				
e. Will the project result in any discharge which will conflict with federal or state air quality regulations?		X				

Comment 3a

Vehicles and small generators used during the treatment create emissions; however, these emissions would dissipate rapidly. Any impacts from these odors would be short term and minor.

Comment 3b

CFT Legumine does not contain the same level of aromatic petroleum solvents (toluene, xylene, benzene and naphthalene) of other rotenone formulations and as a consequence does not have the same odor concerns.

Dead fish would result from this project and may cause objectionable odors (See Section 2a). We would expect odors from dead fish to be short term and minor as most dead decay within a few days.

3.1.4 Vegetation

VEGETATION **Will the proposed action result in:**	**IMPACT** **Unknown**	**None**	**Minor**	**Potentially** **Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Changes in the diversity, productivity or abundance of plant species (including trees, shrubs, grass, crops, and aquatic plants)?			X			4a
b. Alteration of a plant community?		X				
c. Adverse effects on any unique, rare, threatened, or endangered species?			X			4c
d. Reduction in acreage or productivity of any agricultural land?		X				
e. Establishment or spread of noxious weeds?		X				
f. Will the project affect wetlands, or prime and unique farmland?		X				

Comment 4a

Rotenone does not affect plants at concentrations used to kill fish. Impacts from trampling vegetation at staging or detoxification areas are expected to be short term and minor and should be fully healed within 1 growing season.

Comment 4c

Rotenone has no impacts on plant species at fish killing concentrations. The only anticipated impacts to sensitive plant species would be a result of trampling by the personnel applying the rotenone to the stream and any impacts from trampling are expected to be short term and minor. Any trampling impacts should be fully healed within 1 growing season. Impacts to sensitive plants can be minimized by staying as much as possible on existing road and trail systems.

3.1.5 Fish/Wildlife

FISH/WILDLIFE **Will the proposed action result in:**	**IMPACT** **Unknown**	**None**	**Minor**	**Potentially** **Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Deterioration of critical fish or wildlife habitat?		X				
b. Changes in the diversity or abundance of game animals or bird species?			X		yes	5b
c. Changes in the diversity or abundance of nongame species?			X		yes	5c
d. Introduction of new species into an area?			X			5d
e. Creation of a barrier to the migration or movement of animals?		X				
f. Adverse effects on any unique, rare, threatened, or endangered species?			X			5f
g. Increase in conditions that stress wildlife populations or limit abundance (including harassment, legal or illegal harvest or other human activity)?		X				5g
h. Will the project be performed in any area in which T&E species are present, and will the project affect any T&E species or their habitat? (Also see 5f)		X				
i. Will the project introduce or export any species not presently or historically occurring in the receiving location? (Also see 5d)			X			See 5d

Comment 5b

This project is designed to kill unwanted fish. The impact of fish removal will be short term and minor because the stream will be repopulated with WCT following treatment.

Comment 5c

Fish

Rotenone is highly toxic to fish, and the objective of this project is full eradication of non-native Brook, Brown, and hybrid Rainbow x Cutthroat Trout. The treated reaches of Selway Creek will be repopulated with translocated live, wild genetically unaltered WCT from neighboring populations within the Ruby (Jack, Greenhorn creeks), Red Rock (Painter, Browns, Meadow creeks), or Beaverhead (Brays, Cottonwood creeks) Sub-Basins. All translocations of fish will follow procedures and protocols outlined in the Westslope Cutthroat Trout Status and

Conservation within the Beaverhead, Red Rock and Ruby River Sub-basins of Southwest Montana (Bateman et al. 2019) and adhere to FWP Wild Fish Transfer Policy.

Mammals

Ingestion of rotenone, either from drinking rotenone-treated water or from consuming dead fish or invertebrates from rotenone-treated streams, are the likely routes of exposure for mammals. A substantial body of research has investigated the effects of ingested rotenone in terms of acute and chronic toxicity and other potential health effects. In general, mammals are not affected by rotenone at concentrations used to kill fish. Consuming treated water or rotenone killed fish does not affect mammals at fish killing concentrations because rotenone is neutralized by enzymatic action in their stomach and intestines (AFS 2002). Investigations examining the potential for acute toxicity from ingesting rotenone find that mammals would need to consume impossibly high amounts of rotenone-treated water or rotenone-killed fish to obtain a lethal dose. For example, a 22-pound dog would have to drink nearly 8,000 gallons of treated water within 24 hours or eat 660,000 pounds of rotenone-killed fish within a day to receive a lethal dose (CDFG 1994). A half-pound mammal would need to consume 12.5 mg of pure rotenone or drink 66 gallons of treated water for a lethal dose (Bradbury 1986). The effective concentration of rotenone to kill fish is 0.5 to 1.0 ppm, which is several orders of magnitude lower than concentrations that result in acute toxicity to mammals. Evaluations of mammals' potential exposure to rotenone from scavenging indicate that acute toxicity from ingesting rotenone-killed fish is highly unlikely (EPA 2007).

Chronic toxicity associated with availability of dead fish over time would not pose a threat to mammals, nor would other health effects be likely. Rats and dogs fed high levels of rotenone for 6 months to 2 years experienced only diarrhea, decreased appetite, and weight loss (Marking 1988). The unusually high treatment concentrations did not cause tumors or reproductive problems. Toxicology studies investigating potential secondary effects of rotenone exposure have found no evidence that it results in birth defects (HRI 1982), gene mutations (BRL 1982; Van Geothem et al. 1981), or cancer (Marking 1988). Rats fed diets laced with 10 to 1000 ppm of rotenone over a 10-day period did not experience any reproductive dysfunction (Spencer and Sing 1982). Therefore, chronic exposure to rotenone poses no threat to mammals consuming dead fish or treated water. Rotenone does not persist in the environment which also limits the chronic exposure to mammals or other terrestrial organisms. In X creek, rotenone is only expected to persist for 48 hours, so chronic exposure is unlikely. In X lake rotenone is expected to persist 3-5 weeks thus limiting the potential for chronic exposure.to mammals.

A temporary reduction in prey of aquatic origin has the potential to influence some mammals. The American mink is a piscivorous mammalian that is most likely to occur in the project area. Mink are opportunistic predators and scavengers, with fish and invertebrates comprising a portion of their diet. Therefore, the reduction in density of fish following treatment may displace mink to adjacent, untreated reaches until fish populations recover. Nonetheless, as opportunists, American mink have flexibility to switch to other prey species and have the ability to disperse.

Other mammalian predators may experience short-term and minor consequences. Opportunistic black bears (*Ursus americanus*), raccoons (*Procyon lotor*), red foxes (*Vulpes vulpes*), coyotes (*Canis latrans*), otters (*Lontra canadensis*), and striped skunks (*Mephitis mephitis*) would likely consume dead fish immediately after piscicide treatment. The temporary reductions of aquatic prey, and the brief availability of dead fish, constitute short-term and minor effects on mammalian predators and scavengers.

Birds

Birds have the potential to be exposed to rotenone through ingestion of treated water or scavenging dead fish and invertebrates. Like with mammals, rotenone breaks down rapidly within the gut of birds. Moreover, the concentrations of rotenone in waters treated for fisheries management are far below levels found to be toxic to birds. For example, ¼-pound bird would have to consume 100 quarts of treated water, or more than 40 pounds of fish and invertebrates, within 24 hours, for a lethal dose (Finlayson et al. 2000). The EPA concluded that exposure to rotenone, when applied according to label instructions, presented no unacceptable risks to wildlife (EPA 2007). In summary, this project would have no adverse effect birds that ingest water, dead fish, or dead invertebrates.

Numerous bird species rely on prey of aquatic origin, and a rotenone project has potential to temporarily decrease forage availability. Timing the project for when neotropical migrant songbirds are migrating south mitigates for loss of forage base. Like mammals, birds are highly mobile, so the project may result in short-term displacement of birds that consume fish or aquatic invertebrates.

Reptiles

Reptiles, especially garter snakes, have potential to be exposed to rotenone treated water and could scavenge dead fish. The low concentration of rotenone in water and dead fish indicates reptiles would not experience toxic exposure to rotenone. Moreover, the reptilian gut is likely as efficient, or more efficient, at breaking down rotenone given the ability of reptiles to digest bone, hair, and exoskeletons, all of which are far less degradable than the rotenone molecule.

Amphibians

Amphibians are closely associated with water and have potential to be exposed to rotenone during treatment. In general, adult, air-breathing amphibians are not affected by rotenone at fish killing concentrations (Chandler and Marking 1982, Grisak et al. (2007) but the larvae would likely be affected (Grisak et al 2007, Billman et al 2011). Billman et al. (2011) conducted laboratory toxicity tests of the impacts of rotenone on Columbia spotted frogs and Boreal toads. They found significant mortality to the larval stages of both species if they are exposed for 96 hours to 1 ppm CFT Legumine, but the mortality was less when exposed to lower dosages (0.5 ppm) or for a shorter duration (4 hours or less). In Yellowstone Park rotenone caused nearly 100% mortality in gill-breathing, amphibian tadpoles within 24 hours, but did not affect non-gill breathing metamorphs, juveniles, or adults. In the year(s) following, tadpole repopulation occurred at all water bodies treated with CFT Legumine and population levels were similar to or higher than, pre-treatment levels (Billman et al. 2012). Olsen (2017) found that a concentration of 1 ppm rotenone in the West Fork of Mudd Creek produced 100% mortality of tailed frog tadpoles, but concentrations of 0.75, 0.5 and 0.25 mortality averaged only 33%. To mitigate for the potential impacts to larval stages of amphibians, applications can be performed later in the year when the larvae are not present, such as the fall, for shorter duration (4 hours) or at a lesser concentration. Selway Creek will be treated in late summer (last two weeks of August) and drip stations will run for 4 hours.

No amphibian Species of Concern have been observed in Selway Creek, although it is within the general range of Western Toad and Northern Leopard Frog (Montana Natural Heritage Program; http://mtnhp.org). Western toads show the same life stage sensitivity to rotenone, with tadpoles suffering near total mortality to exposure to concentrations of rotenone used in current practice, but resilience to rotenone as metamorphs through adults (Billman et al. 2011). Moreover, adult western toads are likely less sensitive than frogs, given their impermeable skin (Maxell and Hokit 1999). Likewise, adult toads and frogs can leave the aquatic environment, which substantially reduces the potential for exposure (Maxell and Hokit 1999).

Western toads have various characteristics that make them resilient to piscicide projects. Western toads have exceptional fecundity, documentation of egg clutches averaging 5,000 in Colorado, and reaching 16,000 in Montana and 20,000 in the Pacific Northwest. Development from hatching to metamorphosis is related to temperature and can be rapid; however, populations at tree line may fail to metamorphose, and these populations may rely on immigration from lower elevations to persist.

Variability of tolerance to rotenone among species of toad and frog is unknown; however, evidence for resilience to rotenone of other species suggests a general tolerance is possible. A study in Norway examined the response of lake-dwelling amphibians, the common frog (*Rana temoraria*) and common toad (*Bufo bufo*), to treatment with CFT Legumine (Amekleiv et al. 2015). These species were observed before and 1 year after treatment with rotenone, with adults, eggs, and tadpoles being present following treatment. They concluded CFT Legumine had little effect on these species.

Zooplankton

Rotenone has greater initial effects on abundance and diversity of zooplankton than lotic invertebrates, given the longer period of exposure (Vinson et al. 2010). Biomass of zooplankton recovers rapidly; however, zooplankton community composition can take from 1 week to 3 years to return to pretreatment conditions (Beal and Anderson 1993: Vinson et al. 2010). Like stream-dwelling invertebrates, zooplankton have life history strategies that aid in rapid recolonization following disturbance (Havel and Shurin 2004). Recovery of zooplankton varies among taxa, with a dramatic bloom of early colonizers in the first couple of months (Anderson and Beal 1993). Other taxa take longer to recover, but the diversity and abundance can return as quickly as 6 months. Post-treatment monitoring in Devine Lake in the Bob Marshall Wilderness found invertebrates increased in number and very slightly increased in diversity following a rotenone treatment (Rumsey et al. 1996). Schnee (2007b) chronicled two years of post-rotenone treatment monitoring for upper and lower Martin lakes near Olney, Montana that were treated with rotenone in 2005. He concluded that zooplankton density two years after the treatment were similar to pre-treatment densities, and in some cases higher. In a Norwegian lake, the zooplankton were sampled before application of CFT Legumine in 2014, immediately after treatment, and 1-year post-treatment in 2015 (Amekleiv et al. 2015). CFT Legumine had an initial negative effect on zooplankton, with none being detected immediately after treatment. The relative abundance of species of zooplankton changed from pretreatment to 1-year post-treatment with some species comprising a much higher proportion of the zooplankton community. In addition, overall abundance of zooplankton increased considerably post treatment. Removal of common roach (*Rutilus rutilus*), a species of minnow that preys on zooplankton, was attributed to greater post-treatment plankton biomass. Many taxa of zooplankton are capable of asexual reproduction, which favors rapid recolonization from existing eggs and zooplankters that survived treatment. Moreover, lakes have a long-term bank of dormant eggs that are resilient to a range of harsh conditions and provide many years of recruitment of zooplankton within a lake. In addition, wind, animals, and humans are primary agents of dispersal of dormant eggs. Based on these studies and characteristics of zooplankton communities, we would expect the plankton species composition in Selway Lake to return to pre-treatment diversity and abundance within two years and the impacts of treatment with rotenone to be short term and minor. Leaving dead fish within the lake likely provides the nutrients for recovery of lentic invertebrates, and 70 % of dead fish do not surface (Bradbury 1986).

Stream-Dwelling Aquatic Invertebrates

Investigations into the effects of rotenone on benthic organisms indicate that rotenone can result in temporary reduction of gilled aquatic invertebrates within the stream. Invertebrates that were most sensitive to rotenone also tended to have the highest rate of recolonization due to short life cycles (Engstrom-Heg et al. 1978). Although gill-respiring invertebrates are a sensitive group, many are far less sensitive to rotenone than fish (Schnick 1974; Chandler and Marking 1982; Finlayson et al. 2010). Due to their short life cycles (Anderson and Wallace 1984), strong dispersal ability (Pennack 1989), and generally high reproductive potential (Anderson and Wallace 1984), aquatic invertebrates are capable of rapid recovery from disturbance (Boulton et al. 1992; Matthaei et al. 1996). Following a piscicide treatment of a California stream, macroinvertebrates experienced a resurgence in numbers, with black fly larvae recovering first, followed by mayflies and caddisflies within six weeks after treatment (Cook and Moore 1969). Stoneflies returned to pretreatment abundances by the following spring. Studies suggesting long-term reductions in biomass and presumed absence of species following piscicide treatment examined treatments with markedly higher concentrations and durations of piscicide exposure, with a subsequent treatment occurring within a month of the first treatment (Mangum and Madrigal 1998).

A study of response of benthic invertebrates in streams in Montana and New Mexico used a concentration and duration of CFT Legumine similar to the one that is proposed in this project (Skorupski 2011). In Cherry Creek and Specimen Creek, both in Montana, rotenone resulted in minimal effects on macroinvertebrates immediately after. Rotenone had a greater effect on benthos in streams in New Mexico. Regardless of the initial response, invertebrate communities recovered in all streams within a year. In Norway CFT Legumine was applied at of 0.5 ppm, which is lower than the 1 ppm typical of most piscicide projects in Montana and despite initial reductions in invertebrate abundance, most taxa had recolonized with a year (KJærstad et al. 2014).

Because piscicide has potential to alter abundance and species composition of aquatic invertebrates over the short-term, FWP's Piscicide Policy requires pre and posttreatment sampling of benthic, aquatic invertebrates (FWP 2012).

The possibility of eliminating a rare or endangered species of aquatic invertebrate in the proposed streams by treating with rotenone is unlikely. During the initial information gathering phase for this document the Montana Natural Heritage Program (MNHP) was consulted to determine if there were non-target aquatic species of concern (SOC) present in the treatment area (http://mtnhp. org/SpeciesOfConcern/?AorP=a). There were no invertebrate Species of Concern observed in Selway Creek.

Based on the information collected from Selway Creek and the studies reviewed above, FWP would expect the aquatic invertebrate species composition and abundance in the streams/lakes proposed for treatment with rotenone to return to pre-treatment diversity and abundance within one to two years after treatment. Therefore, the impacts to aquatic invertebrate communities should be short-term and minor.

Mussels and Clams

Freshwater mussels have a much higher tolerance to rotenone than fish or other aquatic invertebrates (Hart et al. 2001). Chandler and Marking (1982) found that clams and snails were between 50 and 150 times more tolerant than fish to Noxfish (5% rotenone formulation). Dolmen et al. (1995) found that Pearl Mussels exposed in a field experiment to 5 ppm rotenone for 12 hours experience no mortality. In laboratory experiments these same authors determined the upper lethal limit for pearl mussels was 30-40 ppm rotenone which is more than 30 times the application rate for the proposed project. The Xerces Society recommends treating at less than 4 ppm of formulated rotenone for less than 12 hours and avoiding mussel breeding periods (Blevins et al. 2018). Selway Creek would be treated at 0.5 to 1.5 ppm concentrations of rotenone outside of breeding periods for Western Pearlshell. Experiments were conducted in the West Fork Mudd Creek in the Big Hole River drainage in 2013 on Western Pearlshell Mussels. The results of these experiments indicated that rotenone applied to a stream at a concentration of 1 ppm for 4 hours had no acute effect on mussel mortality 24 or 72 hours after exposure (Olsen 2017). Resultantly, no mortality is anticipated through the application of rotenone at expected treatment concentrations (0.5 to 1.5 ppm) to Selway Creek.

The Western Pearlshell Mussel has a Montana state rank of S2 and a global rank of G4G5. It is listed as a Tier I species in the FWP Fish and Wildlife Conservation Strategy, meaning that the species is in the greatest conservation need and has been recently designated (2011) as a USFS Region 1 Sensitive Species. Adults are sedentary and rarely move more than a few meters throughout their lives. In the larval stage, the Western Pearlshell must briefly parasitize a host fish in order to complete its development. This type of parasitism also functions as a dispersal technique, by transporting larval mussels by way of the host fish up or downstream to new habitats. In Montana, the preferred native host fish is WCT, but Western Pearlshell have been documented to use Bull Trout, Brook Trout and Rainbow Trout. Western Pearlshell mussels are generally found in cold running streams that have a low to moderate gradient and stable gravel substrates. The Western Pearlshell mussel is regionally uncommon, however it can be locally common. In Montana, it is in serious decline and at risk statewide, especially populations in the Upper Missouri River. Within the Upper Missouri River Basin, tributaries to the Beaverhead and Big Hole (Bloody Dick, Deep Creek, and Clam Creek) and upper Madison Rivers hold viable populations. The populations identified within the project area are listed as having fair to poor viability (Stagliano 2015). Abundance is moderate (167 per 1,000 feet of stream) in some reaches; however, only large, presumably older individuals were observed with no evidence of recent recruitment (Oswald et al. 2009). With no or limited reproduction these populations are not likely to persist into the future. Nearby populations with excellent viability (i.e., Deep Creek) and a full range of age classes with reproduction occurring have host species of fish for the parasitic larval portion of the Western Pearlshell mussel present in good densities. Accordingly, restoration of WCT to Selway Creek may improve recruitment success and long-term viability.

Comment 5d

Wild genetically unaltered WCT will be translocated from neighboring populations within the Ruby (Jack, Greenhorn creeks), Red Rock (Painter, Browns, Meadow creeks), or Beaverhead (Brays, Cottonwood creeks) Sub-Basins. All translocations of fish from within or outside of Selway Creek will follow procedures and protocols outlined in the Westslope Cutthroat Trout Status and Conservation within the Beaverhead, Red Rock and Ruby River Sub-basins of Southwest Montana (Bateman et al. 2019) and adhere to FWP Wild Fish Transfer Policy.

Comment 5f

It is expected that we would be treating at concentrations of rotenone (0.5 to 1.5 ppm) that are non-lethal to Western Pearlshell mussels (see 5c). There are no other T&E or sensitive aquatic species observations within Selway Creek (Montana Natural Heritage Program; http://mtnhp.org).

It is possible that Northern Goshawks or Great Grey Owls could consume rotenone-killed fish; however, there would be no impacts to birds of prey that consume rotenone-killed fish. The stream would be repopulated with fish within three years of treatment and there are many other nearby streams with fish. See comment 5c for impacts to birds.

Gray wolves may occur in this area but are not dependent on the stream or fish in the stream for food. See comment 5c for impacts to mammals. The project would not have an impact on gray wolves.

Comment 5g

There will be an increased number of people (15-20) within the drainage during and for the week leading up to treatment. However, because that level of human activity is common within this drainage there will be no affect or stress to any wildlife species.

Comment 5i

The Selway Creek watershed will be restocked with WCT following successful removal of non-native fishes. To provide angling opportunities while the population is being re-established, sterile triploid catchable-size WCT would be stocked in the mainstem of Selway Creek between Short Creek and the barrier, after either the first or second treatment pending results of monitoring, for one to three years following removal of non-native fish. Aboriginal Upper Missouri River basin WCT will be concurrently restored throughout the drainage by translocating live, wild genetically unaltered WCT from neighboring populations within the Ruby (Jack, Greenhorn creeks), Red Rock (Painter, Browns, Meadow creeks), or Beaverhead (Brays, Cottonwood creeks) Sub-Basins. All translocations of fish will follow procedures and protocols outlined in the Westslope Cutthroat Trout Status and Conservation within the Beaverhead, Red Rock and Ruby River Sub-basins of Southwest Montana (Bateman et al. 2019) and adhere to FWP Wild Fish Transfer Policy**.** Red Rock Lakes origin Arctic grayling will be stocked from a genetic reserve brood based on availability using fertilized eggs and remote site incubators. Arctic grayling repopulation would occur at Selway Lake and suitable spring areas (i.e., Spring Creek).

3.2 *Human Environment*

3.2.1 Noise/Electrical Effects

6. NOISE/ELECTRICAL EFFECTS **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Increases in existing noise levels?			X			6a
b. Exposure of people to serve or nuisance noise levels?		X				
c. Creation of electrostatic or electromagnetic effects that could be detrimental to human health or property?		X				
d. Interference with radio or television reception and operation?		X				

Comment 6a

The only noise generated from this project would be from vehicles or small generators but it is consistent with present levels. The noise generated from this would be short term and minor.

3.2.2 Land Use

7. LAND USE **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Alteration of or interference with the productivity or profitability of the existing land use of an area?		X				
b. Conflicted with a designated natural area or area of unusual scientific or educational importance?		X				
c. Conflict with any existing land use whose presence would constrain or potentially prohibit the proposed action?	X					7c
d. Adverse effects on or relocation of residences?		X				

Comment 7c

The CFT Label states:” Do not allow recreational access (e.g., wading, swimming, boating, and fishing) within the treatment area while rotenone is being applied. Therefore, during the application of rotenone, the area being treated must be closed to public access. The stream will be closed for less than 5 days, given the concentrations we will use (0.5 to 1.5 ppm). Any social impacts to individuals who use this area would be short term and minor.

Treatment will be scheduled for late August to minimize impacts to users. Grazing permittees will either be past their existing season of use or have mutually acceptable alternative seasons or pastures prescribed. There is one outfitter in the drainage and it receives fairly heavy public hunting use during elk season. The treatment will be completed about one week prior to the onset of archery season to eliminate potential conflict.

3.2.3 Risks/Health Hazards

8. RISK/HEALTH HAZARDS Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Risk of an explosion or release of hazardous substances (including, but not limited to oil, pesticides, chemicals, or radiation) in the event of an accident or other forms of disruption?			X		YES	8a
b. Affect an existing emergency response or emergency evacuation plan or create a need for a new plan?			X		YES	8b
c. Creation of any human health hazard or potential hazard?			X		YES	see 8ac
d. Will any chemical toxicants be used?			X		YES	see 8a

Comment 8a

The principal risk of human exposure to hazardous materials from this project would be limited to the applicators. All applicators would wear safety equipment required by the product label and SDS sheets. All applicators would be trained on the safe handling and application of the piscicide and potassium permanganate. Piscicide applicators become certified applicators upon passing examinations given by the Montana Department of Agriculture. Beyond this, FWP imposes additional requirements on its own employees through its internal piscicide policy (FWP 2012). An independent certified applicator must accompany each treatment, with "independent" status assigned to an individual who would not be expected to work on the treatment as part of their normal duties. Therefore, at least 2 Montana Department of Agriculture certified pesticide applicators would supervise and administer the project. Materials would be transported, handled, applied and stored according to the label specifications to reduce the probability of human exposure or spill.

Comment 8b

FWP requires a treatment plan for rotenone projects. This plan addresses many aspects of safety for people who are on the implementation team such as establishing a clear chain of command, training, delegation and assignment of responsibility, clear lines of communication between members, spill contingency plan, first aid, emergency responder information, personal protective equipment, monitoring and quality control, among others. Implementing this project should not have any impact on existing emergency plans. Because an implementation plan has been developed by FWP the risk of emergency response is minimal and any effects to existing emergency responders would be short term and minor.

Comment 8c

Information examined here includes an analysis of human health risks relating to rotenone exposure (EPA 2007, Fisher 2007). Acute toxicity refers to the adverse effects of a substance from either a single exposure or multiple exposures in a short space of time. Rotenone ranks as having high acute toxicity through oral and inhalation routes of exposure, and low acute toxicity through exposure to skin (EPA 2007). Acute toxicity would be applicable to undiluted rotenone formulation, with median lethal doses for rats ranging from 39. 5 mg/kg for female rats, and 102 mg/kg for male rats. A rat would need to ingest or inhale 0.04 g of undiluted rotenone for a lethal dose. As rotenone is 5% of most rotenone formulations, a 1 kg rat would have to consume 0.63mL of formulation to receive a lethal dose. Because the treatment area would be closed to public access during rotenone application, exposer of humans to undiluted 5% rotenone formulation would not occur. Only personnel involved in the project who actively measure and applying the chemical could be exposed. Oral or inhalation risks for these persons can be reduced or eliminated by proper use of personal protective equipment.

Chronic exposure is repeated oral, dermal, or inhalation of the target chemical (EPA 2007). In humans, chronic exposure is the length of time equivalent to approximately 10% of the life span. In piscicide treatments in streams, exposure to rotenone lasts at most 4 days. Therefore, the only people likely to experience chronic exposure are the applicators who dispense diluted CFT Legumine over multiple projects. The use of protective eyewear, gloves and dust/mist respirators (in the case of hand held devices that dispense rotenone) is sufficient to protect worker health.

The analysis of dietary risks considered threats to the subgroup “females 13-49 years old” and examined exposure associated with consuming exposed fish and drinking treated surface water (EPA 2007). In determining potential exposure from consuming fish, the EPA used maximum residues in fish tissue. The concentrations of residue considered were conservative, meaning that they may have been an overestimate of the rotenone concentrations in muscle tissue, as they included unpalatable tissues, where concentrations may be higher. The EPA concluded that acute dietary exposure estimates resulted in a dietary risk below the EPA’s level of concern; therefore, consumption of fish killed by rotenone does not present an acute risk to the sensitive subgroup.

Table 2: Toxicological endpoints for rotenone (EPA 2007)

Exposure Scenario	**Dose Used in Risk Assessment, Uncertainty Factor (UF)**	**Level of Concern for Risk Assessment**	**Study and Toxicological Effects**
Acute Dietary (females 13-49)	NOAEL = 15 mg/kg/day UF = 1000 aRfD = 15 mg/kg/day = 0. 015 mg/kg/day 1000	Acute PAD = 0. 015 mg/kg/day	Developmental toxicity study in mouse (MRID 00141707, 00145049) LOAEL = 24 mg/kg/day based on increased resorptions
Acute Dietary (all populations)	An appropriate endpoint attributable to a single dose was not identified in the available studies, including the developmental toxicity studies.		
Chronic Dietary (all populations)	NOAEL = 0. 375 mg/kg/day UF = 1000 cRfD = 0. 375 mg/kg/day = 0. 0004 mg/kg/day 1000	Chronic PAD = 0. 0004 mg/kg/day	Chronic/oncogenicity study in rat (MRID 00156739, 41657101) LOAEL = 1. 9 mg/kg/day based on decreased body weight and food consumption in both males and females
Incidental Oral Short-term (1-30 days) Intermediate-term (1-6 months)	NOAEL = 0. 5 mg/kg/day	Residential MOE = 1000	Reproductive toxicity study in rat (MRID 00141408) LOAEL = 2. 4/3. 0 mg/kg/day [M/F] based on decreased parental (male and female) body weight and body weight gain
Dermal Short-, Intermediate-, and Long-Term	NOAEL = 0. 5 mg/kg/day 10% dermal absorption factor	Residential MOE = 1000 Worker MOE = 1000	Reproductive toxicity study in rat (MRID 00141408) LOAEL = 2. 4/3. 0 mg/kg/day
Inhalation Short-term (1-30 days) Intermediate-term (1-6 months)	NOAEL = 0. 5 mg/kg/day 100% inhalation absorption factor	Residential MOE = 1000 Worker MOE = 1000	[M/F] based on decreased parental (male and female) body weight and body weight gain
Cancer (oral, dermal, inhalation)	Classification; No evidence of carcinogenicity		

UF = uncertainty factor, NOAEL = no observed adverse effect level, LOAEL = lowest observed adverse effect level, aPAD = acute population adjusted dose, cPAD = chronic population adjusted does, RfD = reference dose, MOE = margin of exposure, NA = Not Applicable

The EPA analysis of acute dietary risk for both food and drinking water concluded;

> *When rotenone is used in fish management applications, food exposure may occur when individuals catch and eat fish that either survived the treatment or were added to the water body (restocked) prior to complete degradation. Although exposure from this route is unlikely for the general U.S. population, some people might consume fish following a rotenone application. EPA used maximum residue values from a bioaccumulation study to estimate acute risk from consuming fish from treated water bodies. This estimate is considered conservative because the bioaccumulation study measured total residues in edible portions of fish including certain non-edible portions (skin, scales, and fins) where concentrations may be higher than edible portions (tissue) and the Agency assumed that 100% of fish consumption could come from rotenone exposed fish. In addition, fish are able to detect rotenone's presence in water and, when possible, attempt to avoid the chemical by moving from the treatment area. Thus, for partial kill uses, surviving fish are likely those that have intentionally minimized exposure.*
> *Acute exposure estimates for drinking water considered surface water only because rotenone is only applied directly to surface water and is not expected to reach groundwater. The estimated drinking water concentration (EDWC) used in dietary exposure estimates was 200 ppb, the solubility limit of rotenone. The drinking water risk assessment is conservative because it assumes water is consumed immediately after treatment with no degradation and no water treatment prior to consumption.*
> *Acute dietary exposure estimates result in dietary risk below the Agency's level of concern. Generally, EPA is concerned when risk estimates exceed 100% of the acute population adjusted dose (aPAD). The exposure for the "females 13-49 years old" subgroup (0.1117 mg/kg/day) utilized 74% of the aPAD (0.015 mg/kg/day) at the 95th percentile (see Table 5). It is appropriate to consider the 95th percentile because the analysis is deterministic and unrefined. Measures implemented as a result of this RED will further minimize potential dietary exposure (see Section IV).*

As for evaluating the human chronic risk from exposure to rotenone treated water, the EPA acknowledges the four principle reasons for concluding there is a low risk. First, the rapid natural degradation of rotenone. Second, using active detoxification measures by applicators such as potassium permanganate. Next, properly following piscicide labels which prohibit the use near water intakes. Finally, proper signing, public notification or area closures which limit public exposure to rotenone treated water.

No recreational access (e.g., wading, swimming, boating, and fishing) would be allowed within the treatment area while rotenone is being applied. At applications rates less than 1.8 ppm there is no risk to human health after the chemical has been applied to the water and once the rotenone is mixed recreational access can be restored. At application rates greater than 1.8 ppm in streams recreational access can be can be removed 72 hours after application is complete. For lakes and ponds where rotenone is applied at 1.8 ppm or more, recreational access can be restored following a 24-hour bioassay demonstrating survival of sentinel fish or 14 days, whichever is less. The drainage will be closed for less than 5 days, given the treatment duration and concentrations we will use (0.5 to 1.5 ppm). The aggregate risk to human health from food, water and swimming does not exceed the EPA level of concern (EPA 2007).

Recreationists in the area would likely not be exposed to the treatments because a temporary closure would preclude any from being in the area. Proper warning through news releases, signing the project area, road closure and administrative personnel in the project area should be adequate to keep unintended recreationists from being exposed to any treated waters. Administering application in the late summer would further reduce exposure due to the relatively low number of users in this area.

The occupational risks to humans is low if proper safety equipment and handling procedures are followed as directed by the product labels (EPA 2007). The major risks to human health from rotenone come from accidental exposure during handling and application. This is the only time when humans are exposed to concentrations that are greater than that needed to remove fish. To prevent accidental exposure to liquid formulated or powdered rotenone, the Montana Department of Agriculture requires applicators to be:

- Trained and certified to apply the pesticide in use
- Equipped with the proper safety gear, which, in this case, includes
- respirator, eye protection, rubberized gloves, hazardous material suit
- Have product labels with them during use
- Contain materials only in approved containers that are properly labeled
- Adhere to the product label requirements for storage, handling, and
- Application

Any threats to human health during application would be greatly reduced with proper use of safety equipment. There is an inhalation risk to ground applicators. To guard against this, ground applicators would be equipped with protective clothing, eye, and respirators.

Fisher (2007) conducted an analysis of the inert constituent ingredients found in the rotenone formulation of CFT Legumine for the California Department of Fish and Game. These inert ingredients are principally found in the emulsifying agent Fennodefo[99] which helps make the generally insoluble rotenone more soluble in water. The constituents were considered because of their known hazard status and not because of their concentrations in the Legumine formulation. Solvents such as xylene, trichloroethylene (TCE) and tetrachloroethylene are residue left over from the process of extracting rotenone from the root and can be found in some lots of Legumine. However, inconsistent detectability and low occurrence in other formulations that used the same extraction process were below the levels for human health and ecological risk.

Solvents such as toluene, *n*-butylbenzene, 1,2,4 trimethylbenzene and naphthalene are present in Legumine, and when used in other applications can be an inhalation risk. However, because of their low concentrations in this formulation, the human health risk is low. The remaining constituents, the fatty acid esters, resin acids, glycols, substituted benzenes, and *1*-hexanol were likewise present but either analyzed, calculated or estimated to be below the human health risk levels when used in a typical fish eradication project.

Methyl pyrrolidone is also found in CFT Legumine. It is known to have good solvency properties and is used to dissolve a wide range of compounds including resigns (rotenone). Analysis of Methyl pyrrolidone in CFT Legumine showed it represents about 9% of the formulation (Fisher 2007). The analysis concluded regarding the constituent ingredients in CFT Legumine;

> "…None of the constituents identified are considered persistent in the environment nor will they bioaccumulate. The trace benzenes identified in the solvent mixture of CFT Legumine™ will exhibit limited volatility and will rapidly degrade through photolytic and biological degradation mechanisms. The PEGs are highly soluble, have very low volatility, and are rapidly biodegraded within a matter of days. The fatty acids in the fatty acid ester mixture (Fennodefo99™) do not exhibit significant volatility, are virtually insoluble, and are readily biodegraded, although likely over a slightly longer period of time than the PEGs in the mixture. None of the new compounds identified exhibit persistence or are known to bioaccumulate. Under conditions that would favor groundwater exchange the highly soluble PEGs could feasibly transmit to groundwater, but the concentrations in the reservoir, and the rapid biodegradation of these constituents makes this scenario extremely unlikely. Based upon a review of the physical chemistry of the chemicals identified, we conclude that they are rapidly biodegraded, hydrolyzed and/or otherwise photolytically oxidized and that the chemicals pose no additional risk to human health or ecological receptors from those identified in the earlier analysis. None of the constituents identified appear to be at concentrations that suggest human health risks through water, or ingestion exposure scenarios and no relevant regulatory criteria are exceeded in estimated exposure concentrations…"

To limit exposure to those applying rotenone, proper safety equipment would be used according to the label requirements.

The advantage of CFT Legumine over Prenfish is that it has less petroleum hydrocarbon solvents such as toluene, xylene, benzene and naphthalene. By comparison, Prenfish has a strong chemical odor. CFT Legumine is virtually odor-free and performs almost identically to Prenfish.

Concern over a potential link between rotenone and Parkinson's disease often emerges in piscicide projects. Research into links between rotenone and PD include laboratory studies intended to induce PD-like symptoms in laboratory animals as a tool for neuroscientists to conduct PD-related research (Betarbet et al. 2000; Johnson and Bobvraskaya 2015), epidemiological studies of PD in farm workers (Kamel et al. 2006; Tanner et al. 2011), and laboratory studies evaluating risks associated with inhalation (Rojo et al. 2007). Laboratory studies inducing PD-like symptoms do not provide a relevant model for field exposure by humans. These studies entail injection into the bloodstream of extremely high concentrations of rotenone, often with a chemical carrier to facilitate absorption into tissue, for long durations. Such studies have little applicability to uses of rotenone as a piscicide.

Epidemiological studies do not provide clear evidence that rotenone has a causal link with PD. A recent study linked the use of rotenone and paraquat with the development of Parkinson's disease in humans later in life (Tanner et al. 2011). The after the fact study included mostly farmers from 2 states within the United States who presumably used rotenone for terrestrial application to crops and/or livestock. The results of epidemiological studies of pesticide exposure, such as this one have been highly variable (Guenther et al. 2011). Studies have found no correlations between pesticide exposure and PD (e.g., Jiménez-Jiménez 1992; Hertzman 1994; Engel et al. 2001; Firestone et al. 2010), some have found correlations between pesticide exposure and PD (e.g., Hubble et al. 1993; Lai et al. 2002; Tanner et al. 2011) and some have found it difficult determine which pesticide or pesticide class is implicated if associations with PD occur (e.g., Engel et al. 2001; Tanner et al. 2009). Recently, epidemiological studies linking pesticide exposure to PD have been criticized due to the high variation among study results, generic categorization of pesticide exposure scenarios, questionnaire subjectivity, and the difficulty in evaluating the causal factors in the complex disease of PD, which may have multiple causal factors (age, genetics, environment) (Raffaele et al. 2011). A specific concern is the inability to assess the degree of exposure to certain chemicals, including rotenone, particularly the concentration of the chemical, frequency of use, application (e.g., agricultural, insect removal from pets), and exposure routes (Raffaele et al. 2011). No information is given in the Tanner et al. (2011) study about the formulation of rotenone used (powder or liquid) or the frequency or dose farmers were exposed to during their careers. There is also no information given about the personal protective equipment used or any information about other pesticides farmers were exposed to during the period of the study. Without information on how much rotenone individuals were exposed to and for how long, it is difficult to evaluate the potential risk to humans of developing Parkinson's disease from aquatic applications of rotenone products. Laboratory studies of risks associated with inhalation of rotenone of concentrations likely encountered by fieldworkers have not found PD-like symptoms in exposed rodents (Rojo et al. 2007).

The state of Arizona conducted an exhaustive review to the risks to human health of rotenone use as a piscicide (Guenther et al. 2011). They concluded:

> "To date, there are no published studies that conclusively link exposure to rotenone and the development of clinically diagnosed PD. Some correlation studies have found a higher incidence of PD with exposure to pesticides among other factors, and some have not. It is very important to note that in case-control correlation studies, causal

relationships cannot be assumed and some associations identified in odds-ratio analyses may be chance associations. Only one study (Tanner et al. 2011) found an association between rotenone and paraquat use and PD in agricultural workers, primarily farmers. However, there are substantial differences between the methods of application, formulation, and doses of rotenone used in agriculture and residential settings compared with aquatic use as a piscicide, and the agricultural workers interviewed were also exposed to many other pesticides during their careers. Through the EPA reregistration process of rotenone, occupational exposure risk is minimized by: new requirements that state handlers may only apply rotenone at less than the maximum treatment concentrations (200 ppb), the development of engineering controls to some of the rotenone dispensing equipment and requiring handlers to wear specific PPE."

To reduce the potential for exposure of the public to rotenone during the proposed treatment, areas treated with rotenone would be closed to public access. Placard signs would be placed at access points informing the public of the closure and the presence rotenone treated waters. Personnel would be onsite to inform the public and escort them from the treatment area should they enter. Rotenone treated waters would be contained to the proposed treatment areas by adding potassium permanganate to the stream at the downstream end of the treatment area (fish barrier). Potassium permanganate would deactivate any remaining rotenone before leaving the project area. The efficacy of the deactivation would be monitored using fish (the most sensitive species to the chemical) and a hand-held chlorine meter. Therefore, the potential for public exposure to rotenone treated waters is very minimal. The potential for exposure would be greatest for those certified applicators and operators applying the chemical. To reduce their exposure, label mandates for personal protective equipment would be adhered to (see Comment 8a).

3.2.4 Community Impact

9. COMMUNITY IMPACT **Will the proposed action result in:**	**IMPACT** **Unknown**	**None**	**Minor**	**Potentially** **Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Alteration of the location, distribution, density, or growth rate of the human population of an area?		X				
b. Alteration of the social structure of a community?		X				

c. Alteration of the level or distribution of employment or community or personal income?		X				
d. Changes in industrial or commercial activity?		X				
e. Increased traffic hazards or effects on existing transportation facilities or patterns of movement of people and goods?		X				

3.2.5 Public Services/Taxes/Utilities

10. <u>PUBLIC SERVICES/TAXES/UTILITIES</u> **Will the proposed action result in:**	**IMPACT** **Unknown**	**None**	**Minor**	**Potentially** **Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Will the proposed action have an effect upon or result in a need for new or altered governmental services in any of the following areas: fire or police protection, schools, parks/recreational facilities, roads or other public maintenance, water supply, sewer or septic systems, solid waste disposal, health, or other governmental services? If any, specify: ____________		X				
b. Will the proposed action have an effect upon the local or state tax base and revenues?		X				
c. Will the proposed action result in a need for new facilities or substantial alterations of any of the following utilities: electric power, natural gas, other fuel supply or distribution systems, or communications?		X				
d. Will the proposed action result in increased used of any energy source?		X				
e. Define projected revenue sources		X				
f. Define projected maintenance costs		X				

3.2.6 Aesthetics/Recreation

11. AESTHETICS/RECREATION Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Alteration of any scenic vista or creation of an aesthetically offensive site or effect that is open to public view?		X				
b. Alteration of the aesthetic character of a community or neighborhood?		X				
c. Alteration of the quality or quantity of recreational/tourism opportunities and settings? (Attach Tourism Report)			X		yes	See 11c
d. Will any designated or proposed wild or scenic rivers, trails or wilderness areas be impacted? (Also see 11a, 11c)		X				

Comment 11c

Estimated angling use in Selway Creek from 2005 to 2017 has ranged from 412 to 0 angler days per year. There will be a temporary loss of angling opportunity in Selway Creek between the time of fish removal and repopulation, which is expected to take a little over one full angling season. The first treatment would occur in late August 2020, the second treatment in late August 2021, and repopulation would begin in June 2022. This schedule would result in loss of angling opportunity during the 2021 angling season. To provide angling opportunities while the population is being re-established, sterile triploid catchable-size WCT would be stocked in the mainstem of Selway Creek between Short Creek and the barrier, after either the first or second treatment pending results of monitoring, for one to three years following removal of non-native fish. Following restoration, a unique publicly accessible angling opportunity for native fish will be created. Angling opportunities for the non-native fish that presently occupy Selway Creek will continue to exist downstream of the fish barrier in Selway Creek, throughout the adjacent Bloody Dick Creek, and in many other streams throughout Southwest Montana. Any impacts to aesthetics would be short term and minor and be directly associated with the actual treatment and immediate aftermath, including dead fish in the project area. A tourism report is not necessary to quantify these impacts

3.2.7 Cultural/Historic Resources

12. CULTURAL/HISTORIC RESOURCES **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Destruction or alteration of any site, structure or object of prehistoric historic, or paleontological importance?		X				
b. Physical change that would affect unique cultural values?		X				
c. Effects on existing religious or sacred uses of a site or area?		X				12c
d. Will the project affect historic or cultural resources?		X				

Comment 12c:

There will be no ground-breaking activities associated with this project, and no known cultural or religious ceremonies proposed for the same time this project is proposed. There will be no impacts to historical, cultural or religious values. The Beaverhead-Deerlodge National Forest is evaluating the effects of barrier construction.

3.2.8 Summary Evaluation of Significance

13. SUMMARY EVALUATION OF SIGNIFICANCE **Will the proposed action, considered as a whole:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Have impacts that are individually limited, but cumulatively considerable? (A project or program may result in impacts on two or more separate resources which create a significant effect when considered together or in total.)		X				
b. Involve potential risks or adverse effects which are uncertain but extremely hazardous if they were to occur?		X				
c. Potentially conflict with the substantive requirements of any local, state, or federal law, regulation, standard or formal plan?		X				

d. Establish a precedent or likelihood that future actions with significant environmental impacts will be proposed?		X				13d
e. Generate substantial debate or controversy about the nature of the impacts that would be created?	X				yes	13e
f. Is the project expected to have organized opposition or generate substantial public controversy? (Also see 13e)	X					13f
g. List any federal or state permits required.						13g

Comments 13e and f

The use of pesticides can generate controversy from some people. Public outreach and information programs can educate the public on the use of pesticides. It is not known if this project would have organized opposition.

Comment 13g

The following permit would be required:

- MDEQ Pesticide General Permit

4 ALTERNATIVES

4.1 *Alternatives Evaluated*

4.1.1 Removing non-native Brook, Brown, and hybrid Rainbow x Cutthroat Trout from 36 miles of Selway Creek with rotenone.

This alternative would be highly beneficial to Selway Creek mussels and would be a substantial contribution to the long-term conservation of the WCT in the Red Rock sub-basin. It has a high probability of success and would have short-term, minor effects on wildlife, recreation, and vegetation. FWP has numerous examples of successful projects with similar objectives.

4.1.2 Alternative 2 – No Action.

The no action alternative would allow status quo management to continue which would maintain non-native Brook, Brown and hybrid Rainbow x Cutthroat Trout and may result in eventual extirpation of Pearlshell mussels from Selway Creek. Selection of this alternative would not fulfill the State’s obligation to protect and expand genetically pure WCT populations (FWP 2007), and would not reduce threats to the species that encourage requests for listing WCT under the Endangered Species Act. There would be no other effect on the existing aquatic biota of Selway Creek.

4.1.3 Alternative 3 – Mechanical removal of non-native fish with electrofishing.

Electrofishing has been used to remove unwanted fish from streams with limited success. Mechanical suppression by multiple-pass electrofishing has been used to eradicate unwanted trout (primarily nonnative brook trout) from short sections of several small streams in northcentral Montana (Big Coulee, Middle Fork Little Belt, and Cottonwood creeks) and in southwest Montana (Muskrat, Whites and Staubach creeks). From 2004 - 2010 electrofishing was used annually to remove brook trout from approximately 6 miles of Dyce Creek west of Dillon. Through 2010, it is estimated that this effort reduced Dyce Creek brook trout abundance by 80 - 95%, but due to the complexity of the stream habitat (e.g., over hanging vegetation and debris jams), and length of the project reach (6 miles), brook trout could not be completely eradicated using only electrofishing; continued electrofishing removal efforts in Dyce Creek would have required significant labor resources on an annual basis for an indefinite period of time. Rotenone was used to remove the remaining brook trout from Dyce Creek in August 2011 and 2012. Electrofishing efforts following treatment found no brook trout in the Dyce Creek treatment area. Similarly, the larger size of the proposed Selway Creek project area (36 stream miles and larger base flows than Dyce Creek) would require more annual labor-intensive multiple-pass electrofishing efforts that would not result in complete removal of non-native Rainbow x Cutthroat hybrid and Brook Trout. Shepard et al (2014) described conditions under which electrofishing could be successfully used to eradicate brook trout from small mountain streams in Montana. They found that it took 6-10 multiple-pass treatments to be successful at eradication. Eradication by electrofishing cost \$3,500-\$5,000 per km (2005 dollars) where no riparian vegetation or woody debris clearing was necessary, increasing to \$8,000-\$9,000 per km where clearing was necessary. These reports demonstrate that electrofishing can be successful in some instances, but requires a large amount of time, specific conditions for success, and several years. Numerous examples are provided to demonstrate that it can be ineffective also. Therefore, complete removal of non-native hybrid Rainbow x Cutthroat, Brown, and Brook Trout by electrofishing was determined not to be a feasible alternative for restoring WCT to Selway Creek and was eliminated from further consideration.

5 Public Comments Instructions

FWP will sponsor a public meeting to provide information and obtain public comment. A meeting will take place at in Dillon, MT on September 3rd, at DNRC (860 N. Montana), beginning at 5:30 pm. The comment period is 30 days. Comments must be received by September 9th at 5:00 pm.

Interested parties should send comments to:

Montana Fish, Wildlife & Parks – Region 3
c/o Selway Creek Native Species Restoration
1400 S. 19th Ave. Bozeman, MT 59718

406-994-4042

Email: fwprg3ea@mt.gov

Prepared by: Matthew Jaeger Date: 8 August 2019

6 LITERATURE CITED

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